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SPECIFICATION FOR TRACTOR-MOUNTED SPRING-LOADED CULTIVATORS

(First Reprint DECEMBER 1981)

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INDIAN STANDARDS INSTITUTION
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

January 1973

Indian Standard

SPECIFICATION FOR TRACTOR-MOUNTED SPRING-LOADED CULTIVATORS

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AMENDMENT NO. 1 MARCH 1976
TO
IS:6638-1972 SPECIFICATION FOR TRACTOR-MOUNTED SPRING-LOADED CULTIVATORS

Alteration

(Page 6, clause 4.2, line 2) - Substitute 'number of spaces between rows' *for* 'number of rows'.

(AFDC 41)

Reprography Unit, ISI, New Delhi

AMENDMENT NO. 3 DECEMBER 1979
TO
IS:6638-1972 SPECIFICATION FOR TRACTOR-MOUNTED SPRING-LOADED CULTIVATORS

Alteration

(*Page 6, clause 5.1*) - Substitute '*Max*' for '*Min*'.

(AFDC 50)

Reprography Unit, ISI, New Delhi

AMENDMENT NO. 2 DECEMBER 1978
TO
IS : 6638-1972 SPECIFICATION FOR TRACTOR-MOUNTED SPRING-LOADED CULTIVATORS

Alteration

(*Page* 5, *Fig*. 2) — Substitute the following for the existing figure:

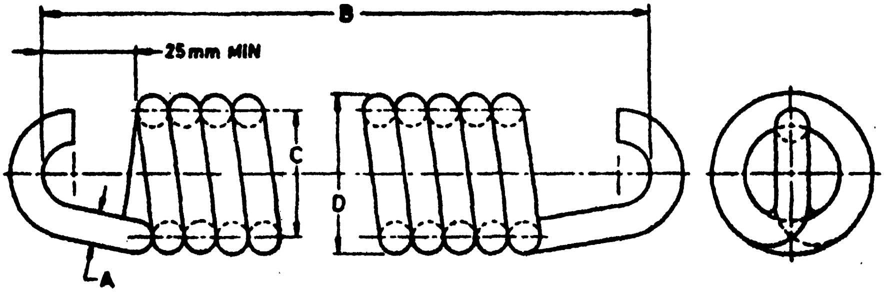

FIG. 2 SPRING

(AFDC 50)

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AMENDMENT NO. 4 MAY 2002
TO
IS 6638 : 1972 SPECIFICATION FOR TRACTOR-MOUNTED SPRING-LOADED CULTIVATORS

[*Page* 6, *clause* **5.1** (*see also Amendment No.* 3)] — Substitute the following for the existing:

'**5.1** Centre to centre distance between tool bars shall be 450 mm, *Min.*'

(*Page* 7, *clause* **6.10**) — Insert the following new clause after **6.10**:

'**6.11** While fixing the shovel to the tine, ensure that the shovel bolts are flush with the surface of the shovel.'

(FAD 59)

Reprography Unit, BIS, New Delhi, India

Indian Standard

SPECIFICATION FOR TRACTOR-MOUNTED SPRING-LOADED CULTIVATORS

0. FOREWORD

0.1 This Indian Standard was adopted by the Indian Standards Institution on 17 July 1972, after the draft finalized by the Farm Implements and Machinery Sectional Committee had been approved by the Agricultural and Food Products Division Council.

0.2 With the increase in the number of tractors in the country, large numbers of tractor-mounted spring-loaded cultivators are being manufactured and used. These cultivators vary considerably in size, dimensions and material of construction from manufacturer to manufacturer which causes great inconvenience to the user in interchangeability of components as well as in mounting with tractors. A need was, therefore, felt for preparation of an Indian Standard to rationalize the sizes, dimensions and material of construction of these cultivators. Keeping in view these points, this standard specifies these requirements without freezing the design to enforce proper quality control measures in the manufacture of these cultivators.

0.3 This standard is related to trade and manufacturing practices prevailing in the country.

0.4 This standard contains clause 6.9 which permits the purchaser to use his option for selection to suit his requirement.

0.5 For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS : 2-1960*. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

---

*Rules for rounding off numerical values (*revised*).

1. SCOPE

1.1 This standard specifies material, dimensions and other requirements for tractor-mounted spring-loaded cultivators.

2. DEFINITIONS

2.0 For the purpose of this standard, the following definitions shall apply.

2.1 Cultivator — An implement with laterally adjustable tines to work between crop rows and can be used for seed bed preparation and for sowing with seeding attachment.

2.2 Spring Loaded Tine — A rigid tine, hinged to the frame and loaded with helical spring so that it swings back when an obstacle is encountered.

2.3 Reversible Shovel — A curved steel furrow opener with both ends pointed, which is attached to the lower end of the tine.

2.4 Sweep — A two-winged cutting point which cuts the soil in horizontal direction under the surface.

2.5 Frame — Rigid structure on which different components are attached.

2.6 Contact Angle — The forward angle between the horizontal ground and the line joining the shovel tip, touching the ground and its centre, when shovel is fitted with tine and placed on its working position (*see* α in Fig. 1).

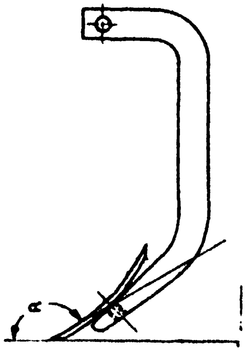


FIG. 1 CONTACT ANGLE ILLUSTRATION

2.7 Spring Index — Ratio of the mean diameter of the spring coil (*see C* in Fig. 2) and the diameter of spring wire (*see A* in Fig. 2).

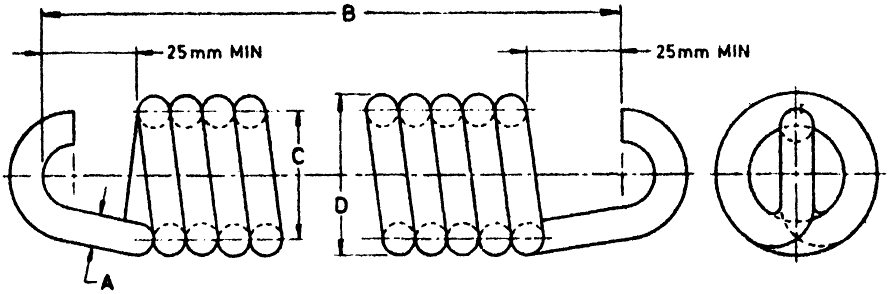


FIG. 2 SPRING

2.8 Initial Tension — Amount of force applied to the spring before its coils start separating.

2.9 Spring Rate — Amount of force, excluding initial tension, if any, required for expansion of per unit length of spring expressed in kgf/mm.

2.10 Total Tension — Amount of force, including initial tension, if any, required to expand the spring up to a certain length.

3. MATERIAL

3.1 The material for the manufacture of different components of the cultivator shall be as given in col 3 of Table 1 and should, as far as possible, conform to the standard and grade given in col 4 and 5 of Table 1.

TABLE 1 MATERIAL FOR DIFFERENT COMPONENTS OF CULTIVATOR

SL No.	NAME OF COMPONENT	MATERIAL	CONFORMING TO	GRADE
(1)	(2)	(3)	(4)	(5)
i)	Frame	Mild steel	IS:226-1969*	—
ii)	Tine	Carbon steel	IS:1570-1961†	C55 Mn 75
iii)	Hitch	Mild steel	IS:226-1969*	—
iv)	Other accessories (bracings, anchor assembly, spring holder, etc)	do	do	—
v)	Helical spring	Spring steel	IS:4454-1967‡	1 or 2
vi)	Hitch pin	Carbon steel	IS:1570-1961†	C 40

*Specification for structural steel (standard quality) (*fourth revision*).
†Schedules for wrought steels for general engineering purposes.
‡Specification for steel wires of cold formed springs.

4. SIZE

4.1 Working Size — The working size of the cultivator shall be determined by multiplying the number of tines and row spacing expressed in m.

4.1.1 When the tines are fitted at minimum spacing it will be designated as minimum working size. Recommended minimum working sizes for 7, 9, 11 and 13 tined cultivators shall be 1·05, 1·35, 1·65 and 1·95 m respectively.

4.1.2 When the tines are fitted at maximum spacing it will be designated as maximum working size. Recommended maximum working sizes for 7, 9, 11 and 13 tined cultivators shall be 1·75, 2·25, 2·75 and 3·25 m respectively.

4.2 Nominal Size — The nominal size of the cultivator shall be determined by multiplying the number of rows and row spacing and expressed in m.

4.2.1 When the tines are fitted at minimum row spacing it will be designated as minimum nominal size. Recommended minimum nominal sizes for 7, 9, 11 and 13 tined cultivators shall be 0·9, 1·2, 1·5 and 1·8 m respectively.

4.2.2 When the tines are fitted at maximum row spacing it will be designated as maximum nominal size. Recommended maximum nominal sizes for 7, 9, 11 and 13 tined cultivators shall be 1·5, 2·0, 2·5 and 3·0 m respectively.

5. DIMENSIONAL REQUIREMENTS

5.1 Centre-to-centre distance between tool bars shall be 525 mm, *Min*.

5.2 The row spacing between two tines shall be adjustable from 150 to 250 mm preferably in steps of 25 mm.

5.3 The contact angle of the shovel with tine shall be declared. The deviation of this angle shall be not more than ± 3° of the declared angle.

5.4 Spring

5.4.1 The diameter of the spring wire shall be 8 mm, *Min* (*see A* in Fig. 2).

5.4.2 The total length of the spring (excluding diameter of the wire at both fixing ends shall be 300 mm, *Min* (*see B* in Fig. 2).

5.4.3 The spring index may be between 4 to 5.

5.4.4 The number of coils may be 27 or 28.

5.4.5 The outside diameter of the spring may be 50 mm (*see D* in Fig. 2).

6. OTHER REQUIREMENTS

6.1 The frame shall be rigid and strong.

6.2 The number of tines shall be 7, 9, 11 or 13.

6.3 The two tool bars of equal length and size shall be provided.

6.4 One spring per tine shall be provided. Two springs per tine shall be preferred.

6.5 The initial tension of the spring shall be up to 70 kgf. Spring rate shall be between 3·5 to 7 kgf/mm. Total tension for 100 mm expansion of the spring shall be between 400 to 700 kgf. The spring shall not show any permanent elongation, when tested in accordance with the method given in Appendix A.

6.6 The reversible shovel fitted in cultivator shall conform to the requirements as stipulated in IS : 6023-1970*.

6.7 The sweep (if fitted) shall conform to the requirements given in IS : 6451-1972†.

6.8 The hitch should be so designed that it should conform to the requirements as stipulated in IS : 4468-1967‡.

6.9 Suitable arrangement should be provided for attaching two depth wheels with depth adjusting mechanism at both ends. The depth wheels should be provided by the manufacturer on the request of the purchaser.

6.10 Operational maintenance manual and a set of tools shall be provided.

7. FINISH AND WORKMANSHIP

7.1 All components of the cultivator should be free from pits, burrs and other visual defects.

7.2 The welding of various parts shall be satisfactory in all respects (*see* **7.1** of IS : 822-1970§).

7.3 The exposed metallic parts shall be free from rust and shall have a protective coating which will prevent surface deterioration in transit and storage.

---

*Specification for reversible shovel.

†Specification for sweep.

‡Dimensions for three-point linkage of agricultural wheeled tractors.

§Code of procedure for inspection of welds.

8. MARKING AND PACKING

8.1 Marking

8.1.1 Each cultivator shall be marked with the following particulars:

a) Manufacturer's name and trade-mark, if any;
b) Maximum size and number of tines; and
c) Batch or code number.

8.1.1.1 These particulars shall be stamped, engraved or embossed on metallic plate rigidly attached on a non-wearing part of the cultivator.

8.1.2 Each cultivator may also be marked with the ISI Certification Mark.

NOTE — The use of the ISI Certification Mark is governed by the provisions of the Indian Standards Institution (Certification Marks) Act and the Rules and Regulations made thereunder. The ISI mark on products covered by an Indian Standard conveys the assurance that they have been produced to comply with the requirements of that standard under a well-defined system of inspection, testing and quality control which is devised and supervised by ISI and operated by the producer. ISI marked products are also continuously checked by ISI for conformity to that standard as a further safeguard. Details of conditions, under which a licence for the use of the ISI Certification Mark may be granted to manufacturers or processors, may be obtained from the Indian Standards Institution.

8.2 Packing — The cultivator should be packed to ensure safety of the components in transportation as agreed to between the purchaser and the supplier.

9. SAMPLING AND CRITERIA FOR CONFORMITY

9.1 Unless otherwise agreed to between the purchaser and the supplier, the method of sampling scheme and criteria for conformity given in Appendix B shall be followed.

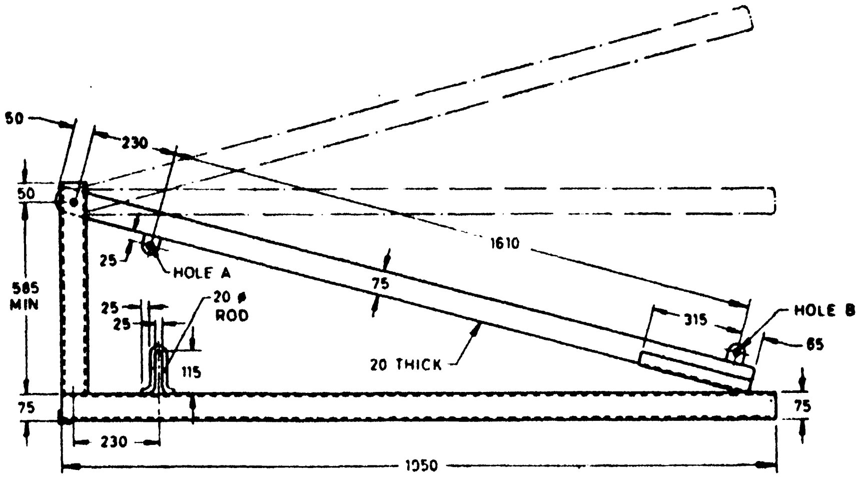
APPENDIX A

(*Clause* 6 5)

INITIAL TENSION AND SPRING ELONGATION

A-1. TEST APPARATUS

A-1.1 A tensile testing machine shall be used for this test. In case this machine is not available, tensile testing jig as given in Fig. 3 may be used.



All dimensions in millimetres.

FIG. 3 SPRING TEST JIG

A-2. TEST PROCEDURE

A-2.1 Test on Tensile Testing Machine — Attach the spring in tensile testing machine and apply the tension. Record the initial tension which should be up to 70 kgf and increase the tension and expand the spring up to 100 mm from its original length. Record the reading. The force should be not less than 400 kgf and not more than 700 kgf. Then release the tension and allow the spring to recoil back. Repeat the above for 3 times. The spring shall not show any permanent elongation after this test.

A-2.2 Test on Tensile Testing Jig — Attach the spring in hole *A* on the upper arm and hook of the base plate. Also attach a calibrated spring weighing balance or dynamometer to the hole *B* in upper arm and apply tension. Record the initial tension which should be up to 70 kgf. Increase the tension and expand the spring up to 100 mm from its original length. Record the tension. The force should be not less than 400 kgf and not more than 700 kgf. Then release the tension and allow the spring to recoil back. Repeat the above for 3 times. The spring shall not show any permanent elongation after this test.

NOTE — Tensions should be obtained by multiplying 8 (mechanical advantage of the testing jig) with spring balance or dynamometer reading.

APPENDIX B

(*Clause* 9.1)

SAMPLING SCHEME AND CRITERIA FOR CONFORMITY OF CULTIVATORS

B-1. SCALE OF SAMPLING

B-1.1 Lot — In any consignment all the cultivators of the same shape and size and manufactured from the same materials under relatively similar conditions of manufacture shall be grouped together to constitute a lot.

B-1.2 For ascertaining the conformity to this specification, the test shall be carried out separately for each lot.

B-1.3 The number of cultivators to be sampled from a lot for ascertaining the conformity to the requirements of this specification shall be according to col 2 of Table 2.

TABLE 2 SCALE OF SAMPLING AND PERMISSIBLE NUMBER OF DEFECTIVES OF CULTIVATORS

(*Clauses* B-1.3, B-2.1 *and* B-2.2)

No. in a Lot	For Visual and Dimensional Tests (*see* 5 and 7)		For Other Tests (*see* 6)	
	Sample Size	Permissible No. of Defectives	Sample Size	Permissible No. of Defectives
(1)	(2)	(3)	(4)	(5)
Up to 100	5	0	2	0
101 to 300	13	1	3	0
301 ,, 500	32	3	5	0
501 ,, 1 000	50	5	8	1
1 001 and above	80	7	13	1

B-1.3.1 The cultivators shall be selected at random from the lot. To ensure the randomness of selection a random number table (*see* IS : 4905-1968*) as agreed to between the purchaser and the supplier shall be used. In case such a table is not available, the following procedure shall be used.

---

*Methods for random sampling.

Starting from any cultivator, count them as 1, 2, 3, ..., up to r and so on in one order where r is the integral part of N/n (N being the number of cultivators in the lot and n the number of cultivators to be selected in the sample). Every rth cultivator thus counted shall be withdrawn to give the required number of cultivators in the sample.

B-2. NUMBER OF TESTS AND CRITERIA FOR CONFORMITY

B-2.1 Tests for Visual and Dimensional Characteristics — The cultivators selected at random according to **B-1.3.1** shall be examined for the dimensional and visual characteristics (*see* 5 and 7). The cultivator failing to satisfy any one or more of these requirements shall be regarded as defective. The lot shall be considered as conforming to the requirements for these characteristics, if the number of defective cultivators in the sample does not exceed the number given in col 3 of Table 2.

B-2.2 Tests Other than Visual and Dimensional — If the lot conforms to the requirements for visual and dimensional characteristics (*see* **B-2.1**) a sub-sample of size given in col 4 of Table 2 shall be taken from the cultivators selected in **B-1.3.1**. Each of the cultivators in the sub-sample shall be tested of the requirements of the characteristics other than visual and dimensional. A cultivator not satisfying any one or more of these requirements shall be regarded as defective. The lot shall be considered as to conform to these requirements if the number of defectives in the sub-sample does not exceed the number given in col 5 of Table 2.

INTERNATIONAL SYSTEM OF UNITS (SI UNITS)

Base Units

Quantity	*Unit*	*Symbol*
Length	metre	m
Mass	kilogram	kg
Time	second	s
Electric current	ampere	A
Thermodynamic temperature	kelvin	K
Luminous intensity	candela	cd
Amount of substance	mole	mol

Supplementary Units

Quantity	*Unit*	*Symbol*
Plane angle	radian	rad
Solid angle	steradian	sr

Derived Units

Quantity	*Unit*	*Symbol*	*Conversion*
Force	newton	N	1 N = 1 kg.1 m/s^{2}
Energy	joule	J	1 J = 1 N.m
Power	watt	W	1 W = 1 J/s
Flux	weber	Wb	1 Wb = 1 V.s
Flux density	tesla	T	1 T = 1 Wb/m^{2}
Frequency	hertz	Hz	1 Hz = 1 c/s (s^{-1})
Electric conductance	siemens	S	1 S = 1 A/V
Pressure, stress	pascal	Pa	1 Pa = 1 N/m^{2}

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